

*A Finely Crafted Unit 8 Opportunity Day*

**Technology Section:** You may use a calculator and Geogebra. Use a pencil. Show all work and circle your answer. Use your time wisely; you will be able to earn additional credit after the timed portion of the test by completing Supercorrections. When you finish, put away your technology and you can come up to get the non-technology part—you may continue to work on both sections without the aid of technology.

1. If  $y$  varies jointly as  $x$  and  $z$  and  $y = 144$  when  $x = 8$  and  $z = 4$ , find the constant of variation. Then, find  $y$  when  $x = 2$  and  $z = 3$ .

2. Where does the hole in the graph of  $f(x) = \frac{x^2 - 2x - 3}{x^2 + 2x - 15}$  occur?

3. Find the equation of the horizontal asymptote of  $f(x) = \frac{3 + 2x^2 + 5x^3}{3x^3 - 8x}$ .

4. Write  $\sqrt[3]{-64x^5y^{12}}$  in simplest form.

5. What transformations must be applied to the graph of  $f(x) = \sqrt{x}$  to obtain the graph of  $g(x) = -\sqrt{x+1} + 3$ ?

6. Solve.

$$\frac{x+3}{x} - \frac{7}{x+2} = \frac{14}{x^2+2x}$$

7. Ian attempts to solve the equation  $\sqrt{x+17} + 3 = x$  at right. Unfortunately, Mr. O'Brien informs him that his answer is incorrect, and he needs to write a Supercorrection. What has Ian done wrong?

$$\begin{aligned} \sqrt{x+17} + 3 &= x \\ \sqrt{x+17} &= x-3 \\ (\sqrt{x+17})^2 &= (x-3)^2 \\ x+17 &= x^2 - 6x + 9 \\ 0 &= x^2 - 7x - 8 \\ 0 &= (x-8)(x+1) \\ x &= 8, -1 \end{aligned}$$

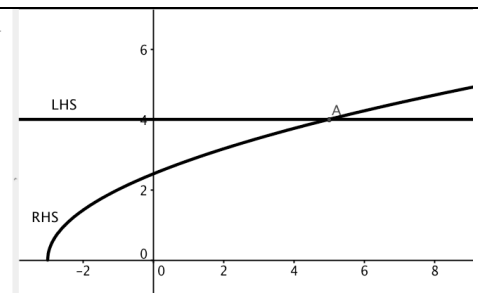
8. Although these two look scary, they're actually not that bad at all- be brave and simplify!

a.  $(3\sqrt[4]{81})^2 - 31$

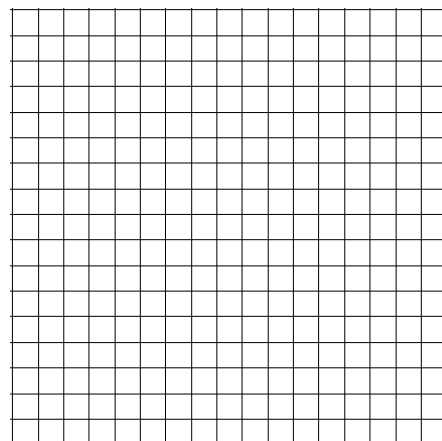
b.  $\frac{1}{5}((\sqrt{9})^3 + (\sqrt[3]{64})^2 + 2)$

9. Use the graph at right to solve the inequality  $4 < \sqrt{2x+6}$ .

LHS(x) = 4  
 RHS(x) =  $\sqrt{2x+6}$   
 Dependent Objects  
 A = (5, 4)



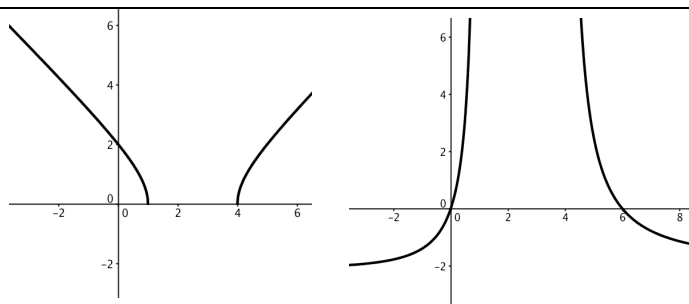
10. Graph  $f(x) = \frac{x^2 + 5x + 6}{x + 3}$  at right.



11. Simplify.

$$\frac{5}{x+2} - \frac{8}{x+4}$$

12. To the right are the graphs of  $f(x) = \sqrt{x^2 - 5x + 4}$  and  $g(x) = \frac{12x - 2x^2}{x^2 - 5x + 4}$ . Tristan claims that the domain of each is  $x < 1$  or  $x > 4$ . Sam disagrees and claims that the graphs don't show everything and that the domain of each is actually all real numbers. Kendra knows that each boy is incorrect. What is the correct domain of  $f$  and the correct domain of  $g$ ?



13. Simplify.

a.  $(3 + \sqrt{6})(4 - 2\sqrt{6})$

b.  $(3 + \sqrt{6}) + (4 - 2\sqrt{6})$

14. Consider the two expressions  $\frac{5}{\sqrt{7}}$  and  $\frac{5}{\sqrt{7}+2}$ . Write each with a rational denominator.

15. Simplify.

$$\frac{x^2 + 2x}{x^2 - 9} \div \frac{x^2}{x^2 + 5x + 6}$$

16. Alex is studying for her final exam and comes across the problem  $\sqrt{12} + \sqrt{48}$ . She simplifies this as  $\sqrt{60}$ . When she checks on her calculator, though, she finds that  $\sqrt{12} + \sqrt{48} \approx 10.39$ . How does this show that her answer of  $\sqrt{60}$  must be incorrect? What is the correct simplification of  $\sqrt{12} + \sqrt{48}$ ?

**Bonus:** Write a rational function with a horizontal asymptote of  $y = 2$  and a vertical asymptote of  $x = -2$  and a hole at  $x = 1$ .

*Go back and check your answers- the fewer Supercorrections, the better!*